The Sustainability of Canadian Provincial Government Health Spending: An Expenditure Category Approach

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Paper prepared for presentation at the Meetings of the Canadian Economics Association, Ottawa, June 2-5, 2011.

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Rising expenditures, shrinking resources and the growing share of health in provincial government budgets make health care sustainability a constant policy issue. Between 1975 and 1990, the average annual growth rate for real per capita provincial government health expenditures was 2.7 percent. During the retrenchment of the early 1990s, it grew at an average annual rate of -0.2 percent. Since 1996, it has averaged 3.6 percent. The expenditure trajectory has shifted upward. Is public health care sustainable? Much like the 1990s, one cannot expect governments to not take measures on the expenditure side if health spending continues to rise. This paper examines the evidence on sustainability by health expenditure category and finds the degree of sustainability related to the expenditure category as well as other factors. Growth rates of GDP, federal transfer payments are key factors as well as any potential policy response to cost increases. Technological extension in combination with population aging is also a factor. The most sustainable expenditure categories appear to be hospitals and physicians whereas the least sustainable to date include drugs and capital spending. The differences in determinants across the various expenditure categories as well as differences across the provinces suggest that a one-size-fits all approach to sustainability will not be an optimal response.

1. Introduction

The sustainability of public health care in Canada is an issue that will define the next quarter century of Canadian policy. Health spending is rising faster than economic growth generating concerns about sustainability of the public health care system. The health sustainability issue has been addressed in a number of recent studies[1] but with some exceptions, they have focused mainly on aggregate health spending.[2] This study extends the analysis of sustainability by examining spending at the level of health expenditure categories. This paper reviews some of the recent trends in government health expenditure to establish context for the issue and then defines fiscal sustainability in health care and provides evidence corresponding to those definitions including evidence by health expenditure category. Finally, the determinants of health expenditure by category are examined using regression analysis to provide additional insight on expenditure drivers. In brief, the evidence suggests that the sustainability issue is indeed complex with potentially no one size fits all solution. Some provinces have more sustainable public health care systems than others and within these provinces some categories of health spending are more sustainable than others. Hospital and physician services, for example, appear to be the most sustainable while major challenges exist in the areas of drugs, public health and all other health spending. Based on the determinants of health spending analysis, sustainability is linked to economic growth, technological change, demographics and policy responses but there can be no global policy response to the issue across provinces.

2. Recent Trends in Provincial Government Health Expenditure

An examination of real per capita provincial government health spending over the period 1975 to 2010 shows rising expenditures with an acceleration in spending after 1996. These trends have generated some alarming predictions especially when simple growth rates are extrapolated into the future. For example, a recent report by TD Economics (2010) argues that in Ontario, public health expenditure continues to grow at 6.5% per year, by 2030, health will consume about 80% of the provincial government budget by 2030. Another report for Alberta (Di Matteo and Di Matteo, 2009) argues that by 2030, public health spending in Alberta could account for as much as 87% of government revenues although there is also the lower end estimate of 32%.

Figure 1 plots real per capita provincial government health spending in 1997 dollars. In 1975, average real per capita provincial government health expenditure was $1,150. It rose until 1992, when it reached $1,727 – an increase of 50 percent in real per capita spending. In response to fiscal restraint of the early 1990s, it then declined – reached $1,637 in 1996 and then began to rise again and hit 2,784 by

[1] See TD Economics (2010) and Dodge and Dion (2011).
[2] One major exception is the recent report by the Canadian Health Services Research Foundation (Constant et. al., 2011) which notes the fastest growing areas of health spending are capital, drugs and public health.

2010. There has been a much faster growth rate since the mid 1990s and over the period 1996-2010 spending increased 70 percent. Figure 2 plots the annual growth rates of real per capita government health spending by province.
The average growth rate from 1975-1990 of the annual rates across the provinces was 2.7 percent while for 1990-1996 it was -0.15 percent. For the 1996 to 2010 period, the average annual growth rate was 3.6 percent.

What is also interesting about these health expenditure trends is that the growth rate has varied substantially across the ten provinces. Figure 3 ranks the average annual growth rates for the 1975-2010 period for the ten provinces and shows that average growth has been the highest in Newfoundland and Labrador and the lowest in Quebec. Therefore, along with some substantial differences in the real per capita amount of spending (1997 dollars) which in 2010 ranged from a low of 2,547 in Quebec to a high of 3,361 in Newfoundland and Labrador, there are also differences in the growth rate of those expenditures. Growth rates are highest in the Atlantic provinces of Newfoundland and Labrador, New Brunswick and Nova Scotia at over 3 percent. They are lowest in Ontario, British Columbia and Quebec.

Figure 1
Source: CIHI, National Health Expenditures Database.

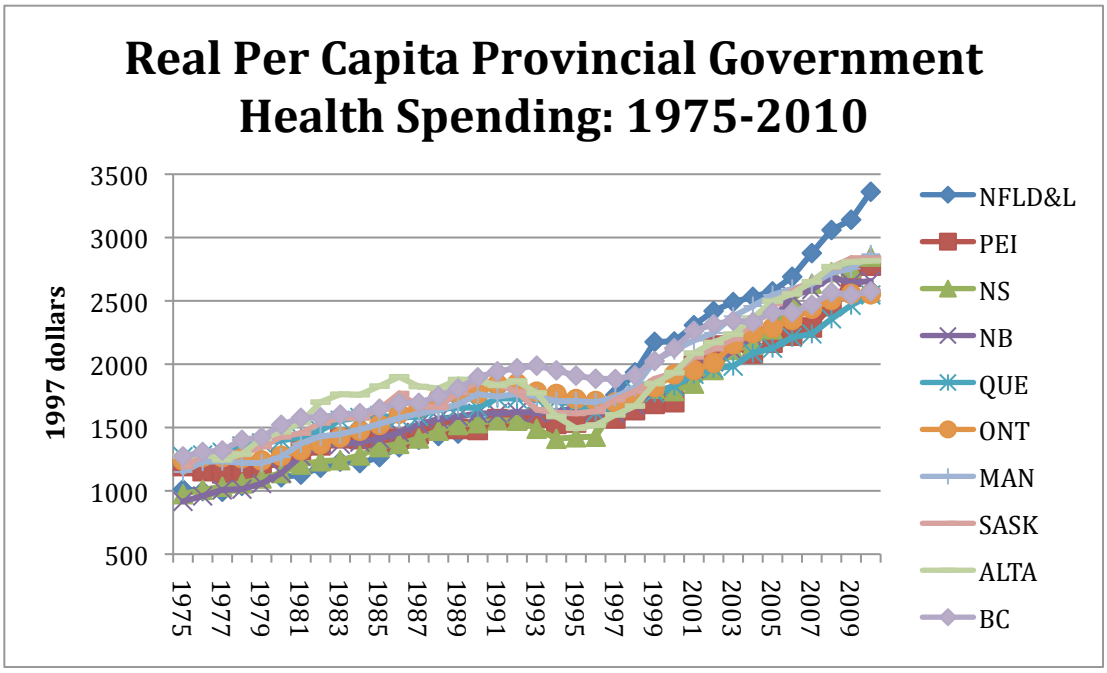


Figure 2
Source: CIHI, National Health Expenditures Database

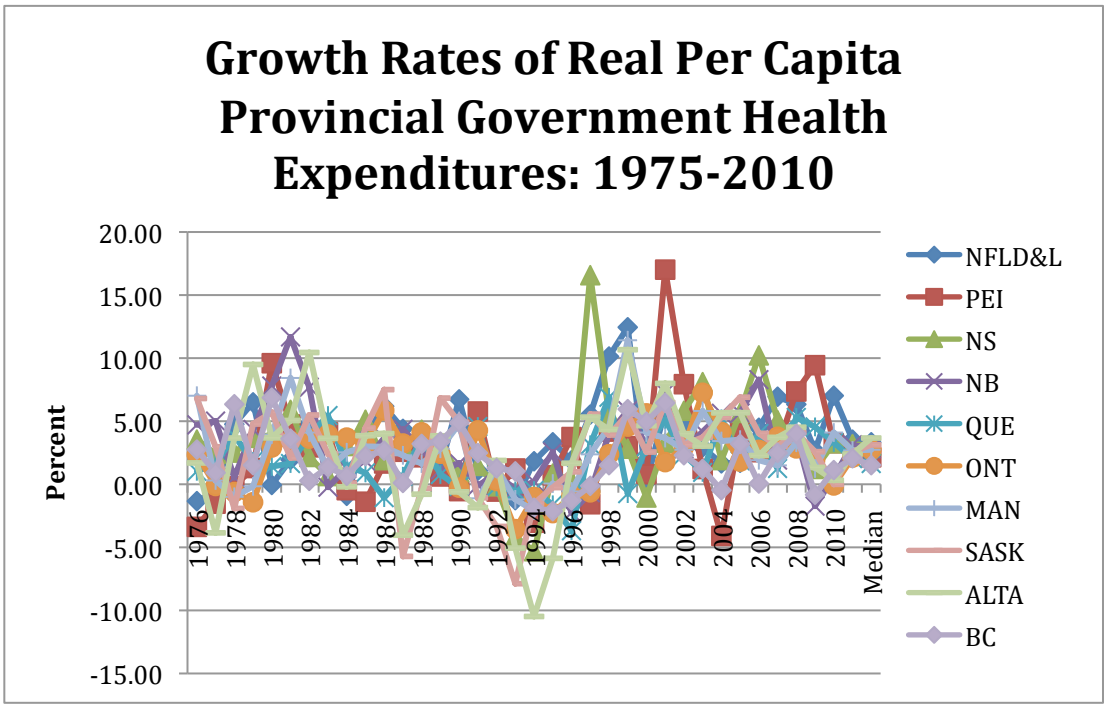
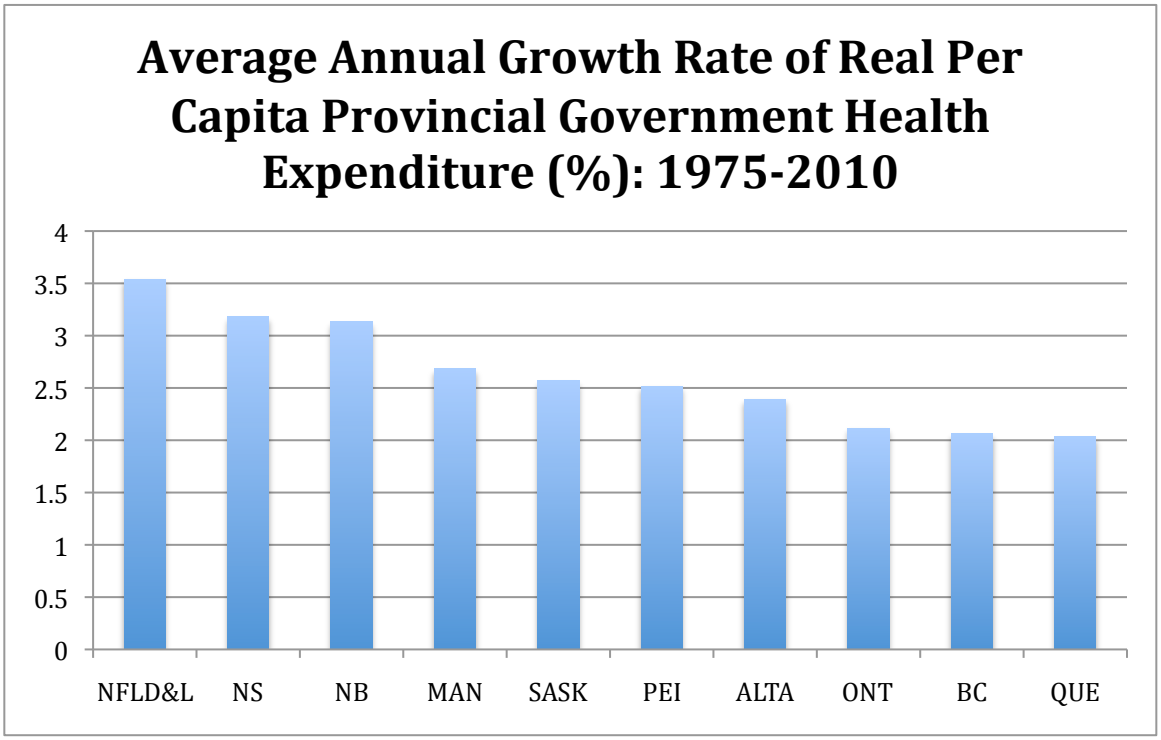


Figure 3
Source: CIHI, National Health Expenditures Data Base



3. Definition, Measurement and Evidence on Sustainability

The question of sustainability asks whether Canadians face uncertainty regarding the availability of public funds to provide universal, high-quality health care.[3] More specifically, the question is one of fiscal sustainability – having the resources needed to pay for what you want. The definition and measurement of sustainability is important because it defines the policy problem and what the eventual solutions to the issue may be. Unlike pensions, which is accumulated money with which to pay out future obligations, health care spending is a yearly consumption or investment expenditure out of current income and is directly tied to current willingness to pay.[4]

Ruggeri (2006) argues fiscal sustainability is uniquely related to public sector funding and provision. If health care was a purely private good, then the amount of health care people were willing and able to pay for would be provided, generating a market equilibrium amount. If, after market allocation there were some people consuming less health care, the issue would not be one of sustainability but of equity. With public provision and funding of health care, public choices have to now be made collectively on how much health care to provide and the levying of taxes to pay for that care. Therefore, one solution to the sustainability problem could be to simply transfer all health spending to the private sector; a decision that the Romanow Report (2002) argues would not be in accord with Canadian values.[5]

The concept of fiscal sustainability is also related to the concept of fiscal burden in the public finance literature, which makes use of the concepts and techniques of intergenerational accounting. The intergenerational accounting approach to health care sustainability asks what fiscal burden current health spending policy imposes on future generations, if this policy can be continued without major sacrifices on the part of current and future taxpayers and what policies would ensure that future generations face the same fiscal burden as current generations.[6] Comley and McKissack (2005: 5) provide a technical definition of public sector fiscal sustainability as one in which all "obligations, current and future, can be met without changing current policy settings". This effectively

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[3] See Guyatt, Yalnizyan and Deveraux (2002: 36). Marchildon et al. (2004: 3) defines sustainability as "the sufficiency of resources over the long term to provide timely access to quality services that address Canadians' evolving health needs."

[4] It should be noted that health care funding could be treated in a manner more akin to pensions. One can increase tax rates or reduce expenditures now to set aside financial resources to pay for health care in the future by building a large health spending endowment fund – prefunding - that will eventually generate income to cover rising health expenditures. However, future health care expenditures are less certain than pension commitments and there ultimately must still be a willingness to pay higher taxes now to fund the future stream of uncertain benefits. For a discussion of the "pre-funding" approach as applied to Alberta, see Di Matteo and Di Matteo (2009).

[5] According to the Romanow Report (2002: xvi) : "Canadians consider equal and timely access to medically necessary health care services on the basis of need as a right of citizenship, not on a privilege of status or wealth."

[6] Kotlikoff and Raffelhuschen (1999). For other generational discussions of health care see also Cutler and Sheiner (2000) and Auerback, Gokhale and Kotlikoff (1992).

translates into a situation whereby the present value of all future public sector budget surpluses is sufficient to pay off the debt. However, this is difficult to implement just for the public health care sector as its expenditure decisions are intertwined with other public spending decisions and involves political decision- making which renders generational imbalance more of a counterfactual than an actual outcome though it does help to isolate key variables for a policy debate.[7]

A variety of measures can assess sustainability chief of which are the share of gross domestic product accounted for health care spending as well as the share of total government spending accounted for by health. If these are rising, then a larger share of resources is being devoted to health care and may be indicative of a sustainability problem. However, they may simply also reflect a social choice to spend more on health.

Assessing the fiscal sustainability of Canadian provincial government health spending ultimately requires that health expenditure growth be compared to growth in measures of the resource base.[8] One can examine the per capita value of provincial government health care spending over time and compare its growth rate to growth rates in per capita income or per capita public sector revenues.[9] If one defines the rate of growth of real per capita provincial government health spending as h, and resource base measures as r, then if h>r, there is a sustainability issue. Measures of r can include the growth of real per capita GDP, real per capita total government revenues and real per capita federal cash transfers.

Figure 4 presents provincial government health spending as a share of GDP. In 1981, average provincial government health spending as a share of GDP averaged 6.2 percent ranging from a high of eight percent in PEI to a low of 3.6 percent in Alberta. By 2010, average provincial government health spending as a share of GDP averaged 8.7 percent ranging from a high of 11.8 percent in PEI to a low of 5.6 percent in Alberta. While H/GDP has risen, it has not grown as dramatically as the share of government spending accounted for by health, which is presented in Figure 5. In 1975, the average share of provincial government program spending accounted for by health was 26.3 percent while in 2010 it was 38.6 percent. The share ranges across provinces. In 2010, 45 percent of Ontario government program spending was on health while 33.8 percent of Newfoundland and Labrador's was on health. Health spending has grown much faster than other categories and has come to take up a larger share of government program spending though much of the increase in the post 1996 period has been fueled by the fiscal dividend of declining debt service charges.[10]

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[7] See Kotlikoff and Raffelhuschen (1999: 162) who write: "The calculation of generational imbalance is an informative counterfactual, not a likely policy scenario, because it imposes all requisite fiscal adjustments on those born in the future."

[8] Skinner and Rovere (2008:3) argue that government spending on health care should be considered unsustainable when on average it grows faster than revenue.

[9] This connection between health care costs growing faster than general government revenue was noted by the Fykes Commission report on health care in Saskatchewan. See Boothe and Carson (2003: 12).

[10] See Landon et al., (2006).

Figure 4
Source: CIHI, National Health Expenditure Database

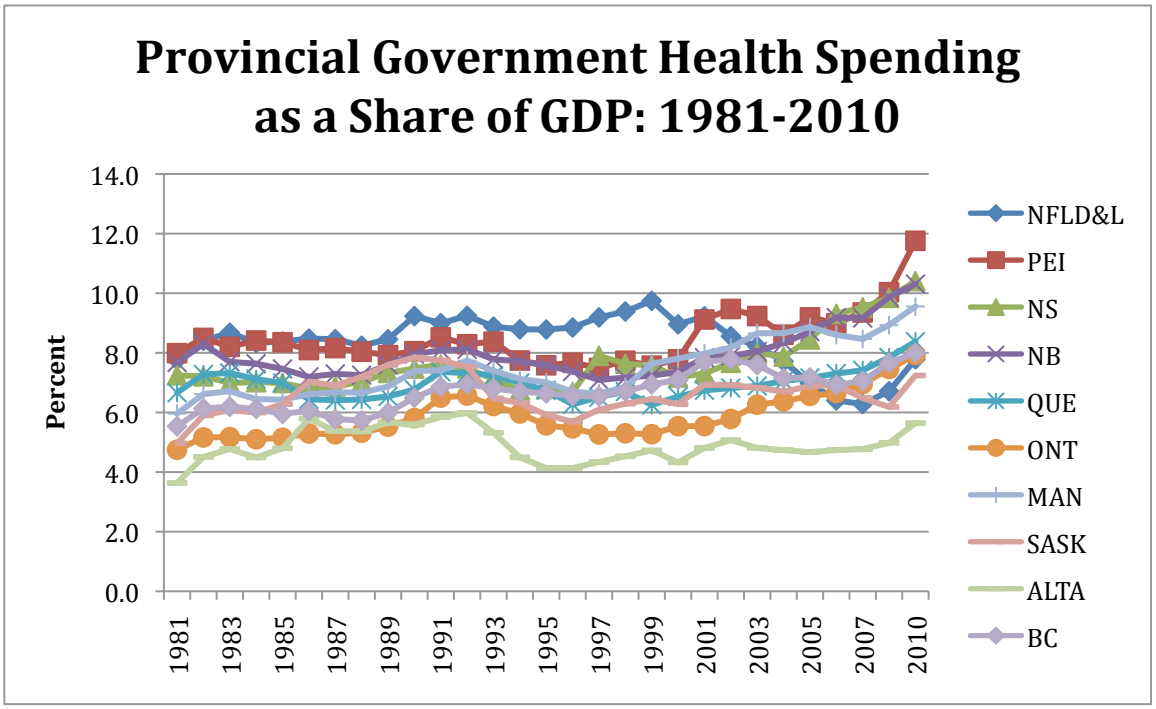


Figure 5
Source: CIHI, National Health Expenditure Database

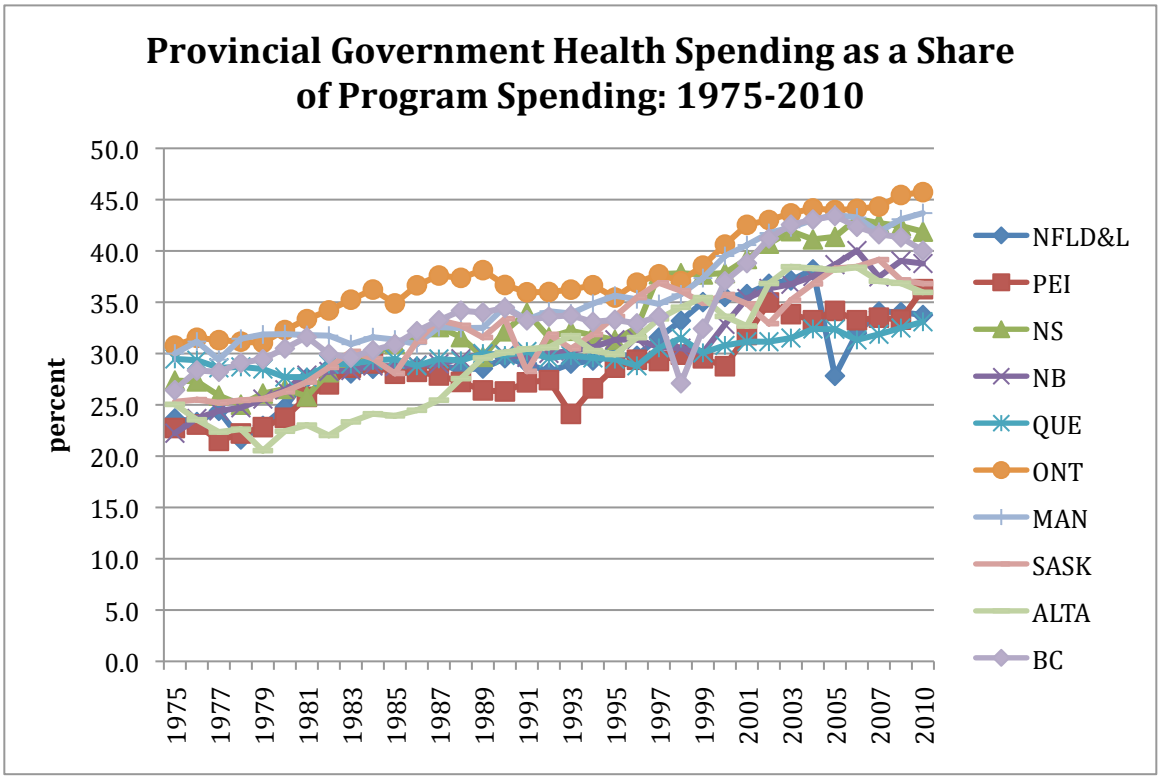
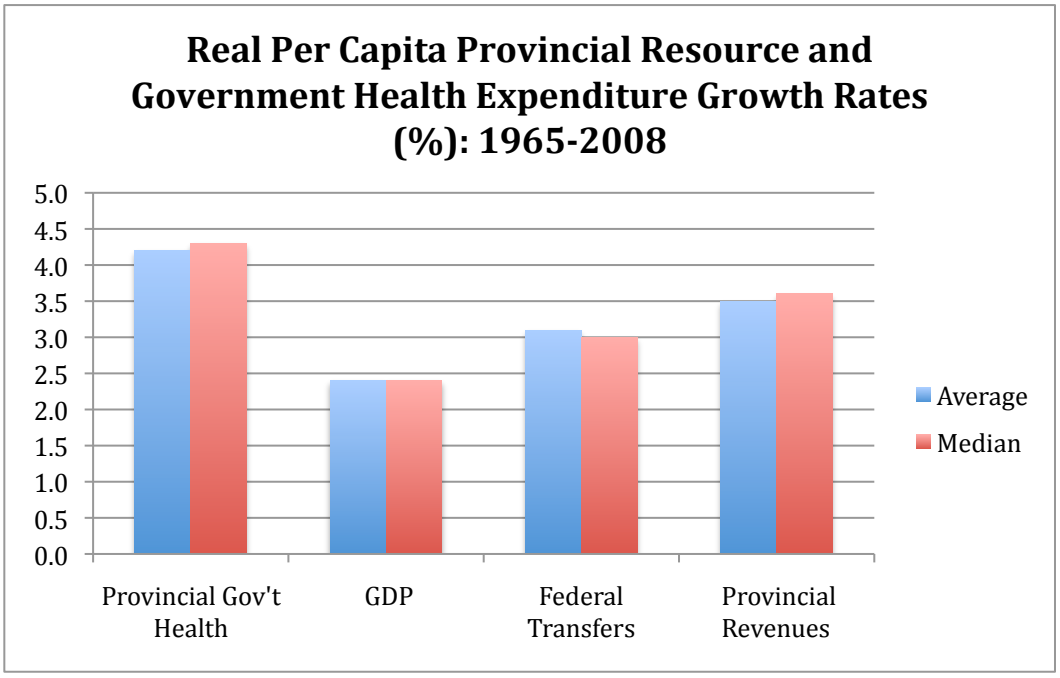


Figure 6
Source: CIHI, National Health Expenditure Data Base & Statistics Canada.



As a more explicit sustainability measure, Figure 6 presents average and median growth rates for real per capita provincial government health expenditures, real per capita GDP, real per capita provincial government revenues and real per capita federal transfers (in 1997 dollars) for the period 1965 to 2008. The results suggest that provincial government health spending has been clearly unsustainable given that the per capita growth rates in health spending over time have exceeded those of GDP, federal transfers and provincial revenues. Moreover, when these indicators are done individually by province, they reveal that each individual province has also seen its real per capita provincial government health spending exceed the growth of real per capita GDP, revenues and transfers.[11] Of course, this begs the question as to whether sustainability is simply an issue because of tax cuts brought in after the late 1990s, which have eroded provincial revenue bases.[12]

Figures 7 and 8 show that real per capita revenues have generally grown over time while the share of GDP accounted for by provincial revenues has remained remarkably stable. Average real per capita provincial government revenues have soared fairly steeply. The average (in 1997 dollars) in 1975 was $3,882 while in 2008 it had risen to $7,117 – an increase of 83 percent. However, as a share of GDP, provincial government revenues have stayed relatively constant – in 1975 they averaged across Canada's provinces at 22% and in 2008 were 21.5%. The provincial average has been as high as 26 percent (1991) and as low as 21 percent (in 2004). There may indeed be some room for increases in the revenue to GDP ratio as a solution to sustainability issues. At the same time, the average revenue to GDP ratio is about the same as it was when health spending was "more sustainable" which suggests that the problem is not revenue per say but the fact that health spending is rising faster than other categories in the government budget envelope.

[11] See Di Matteo (2010).

[12] See Evans (2003, 2007). Evans (2007) maintains that the share of national income devoted to public health insurance has been remarkably stable but provinces have introduced fiscal measures reducing their rates of personal and corporate income taxation. This is part of a broader agenda as Evans (2003: 19) argues that: "Claims that Canada's Medicare is economically or fiscally unsustainable represent part of a broader propaganda campaign to advance those priorities, 'softening up' a generally skeptical and unsympathetic public to accept that the current form of public health insurance…is simply impossible to maintain. The agenda is being advanced by right-wing governments in the larger provinces with sympathetic coverage from the country's dominant newspaper chain."

Figure 7
Data Source: Statistics Canada.

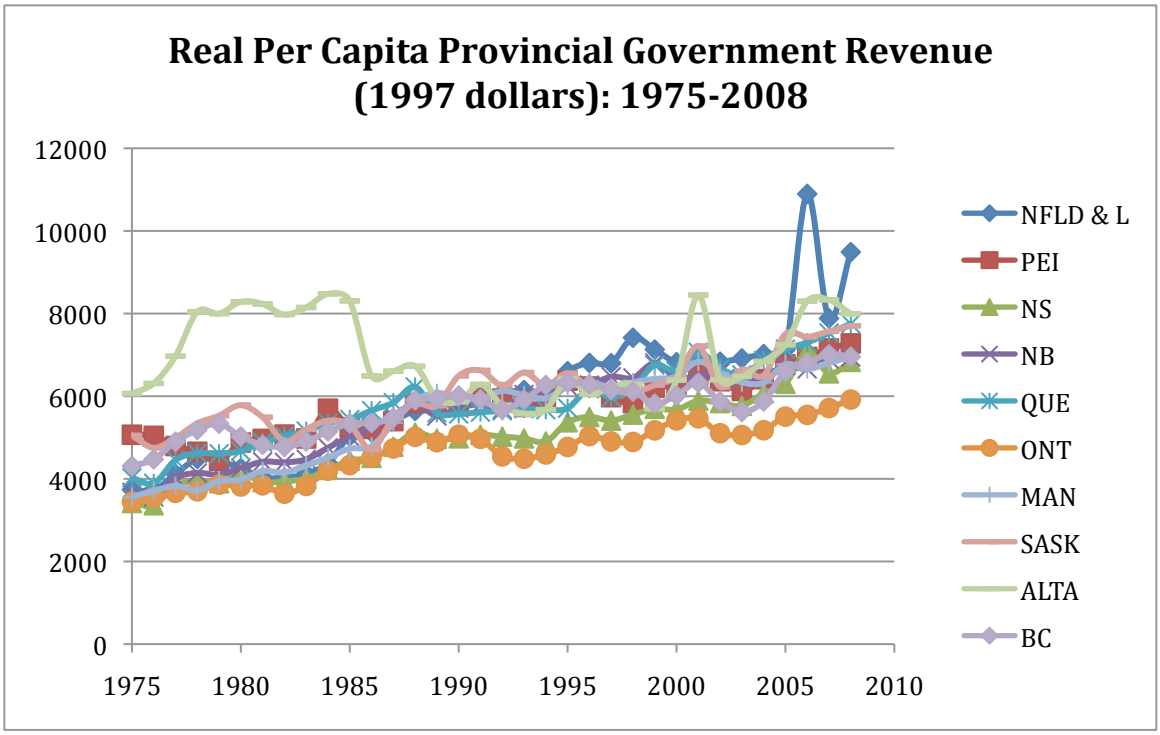
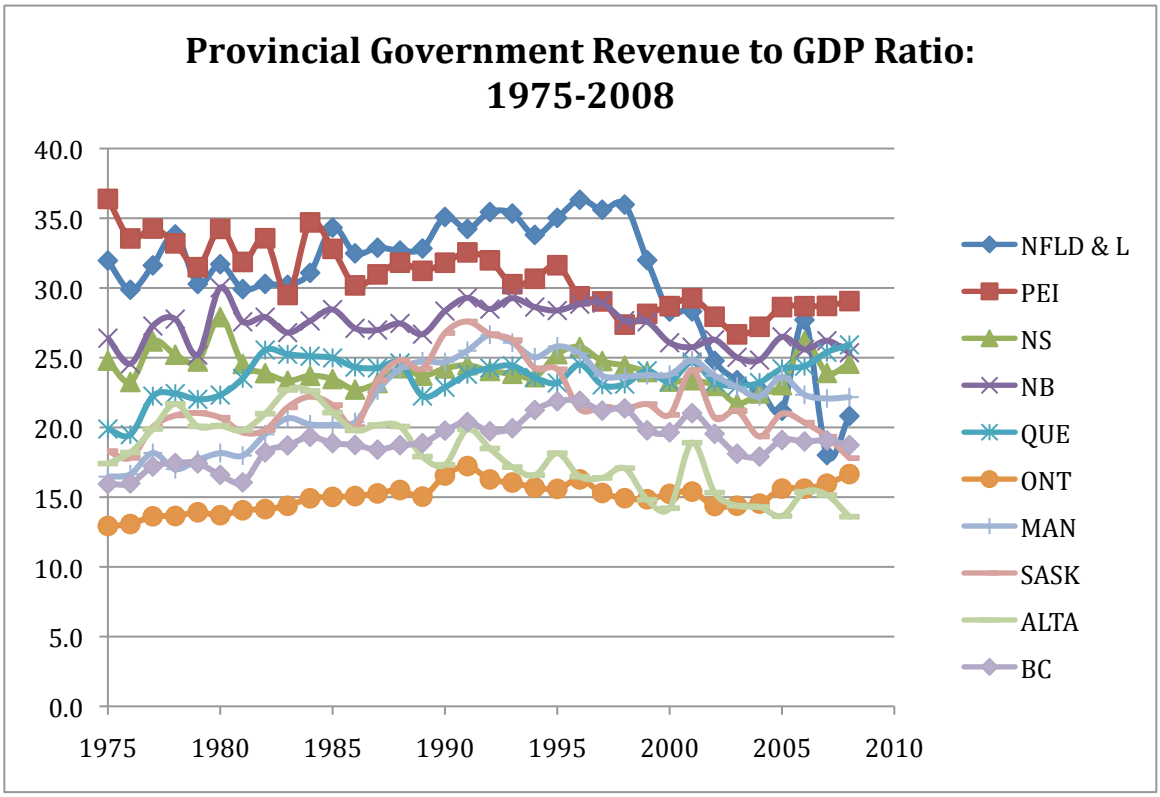


Figure 8
Data Source: Statistics Canada



4. Sustainability: An Expenditure Category Approach

Examining sustainability on the basis of growth in total provincial government health spending does not take into account differences in the composition of spending over time. Different expenditure categories have grown at different rates. Health expenditure data is available by category for the period since 1975 and when average growth rates across the provinces are calculated for these categories and compared to growth rates in the resource indicators it is apparent that some categories of provincial government health spending are more sustainable than others as illustrated in Figure 9.[13]

Growth rates in provincial government health expenditure for the post 1975 period are lower than when the 1965 to 1974 period is included as this period marks the rapid increases of the onset of public health care. For the period 1975 to 2008, average real per capita GDP across Canada's provinces grew at an annual rate of 1.8 percent, provincial government revenues at 2 percent, federal cash transfers at 2.1 percent and health spending at 2.8 percent –again an unsustainable situation.[14] However, the average of the annual growth rates for real per capita provincial government hospital spending across the provinces was 1.7 percent and 2.8 percent for physician. Drugs, on the other hand grew at 7.5 percent, public health at 4.9 percent, capital at 14 percent and all other health at 9.3 percent. In other words, hospital and physician spending are relatively sustainable compared to these other categories.

There are also differences across the provinces when it comes to expenditure categories. For example, real per capita provincial government hospital expenditures has gone through three phases – a rising phase from 1975 to the early 1990s, a retrenchment phase from the early to mid-1990s and a rapid increase phase since the mid-1990s as Figure 10 depicts quite clearly. There are differences in real per capita spending across the provinces and growing divergence in per

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[13] Data on provincial government health expenditures come from the Canadian Institute for Health Information, and are provided in nine separate expenditure categories. *Hospital* expenditures are for public acute and chronic care hospitals as well as specialty hospitals such as paediatrics and neurology. *Other institutions* refer to residential care facilities such as homes for the aged, homes for the physically and mentally handicapped or facilities to treat drug and alcohol problems. *Physician* expenditures cover the professional health services provided by physicians. However, the payment of physicians on payrolls of hospitals or public agencies is excluded and is included with the relevant category. *Other professional* expenditures include dentists, chiropractors, optometrists, private duty nurses and physiotherapists. The *drugs* category includes expenditures on provincial government prescription drug plans. *Capital* expenditures are expenditures on construction, machinery and equipment of hospitals and other health institutions. *Public health* expenditures generally cover measures to prevent the spread of communicable diseases as well as food, drug and workplace safety. *Administration* expenditures refer to spending related to the cost of providing health insurance programs as well as the costs of infrastructure to operate health departments. However, the administrative cost of running hospital and drug programs is included under the relevant category of service. Finally, the *all other health* expenditure category represents remaining spending on home care, medical transportation, hearing aids and eyeglasses.

[14] These were calculated as the average of the annual growth rates for each province.

capita hospital spending after the mid 1990s. Moreover, when you rank the provinces according to growth in spending over the entire period, growth in hospital spending has been the greatest in Newfoundland and Labrador, New Brunswick and Nova Scotia and least in Saskatchewan, Ontario and Quebec (See Figure 11). Highest ranked Newfoundland and Labrador spends approximately one thousand dollars per capita more on hospitals than lowest ranked Quebec.

Similar patterns are also present the other health expenditure categories – there are divergences in the amount of per capita spending across the provinces as well as differences in the growth rates over time. Newfoundland and Labrador, Prince Edward Island and New Brunswick have seen the largest increases in real per capita physician spending while Alberta, Quebec and British Columbia have seen the lowest. In the case of drugs, the greatest increases in drug spending have been in Ontario, Prince Edward Island and Newfoundland & Labrador while the lowest increases have marked Alberta, Saskatchewan and British Columbia.

Why does Newfoundland spend 39 per cent per person more on health in general and 75 per cent more on hospitals than Quebec? Why does Ontario spend 68 per cent more per person on drugs and 53 per cent more on physicians than British Columbia? Why does Prince Edward Island spend $184 per person on administration for provincial government health spending while Saskatchewan is able to spend only $26 dollars -- 86 per cent less? If there is a "public" health-care system, why a divergence in per capita provincial government spending and why does the divergence appear to be growing, particularly in categories such as public health and all other health, drugs and hospitals?

While demographic and environmental factors across the provinces can account for some of these differences, the provinces may also have some very different approaches to their health-care systems when it comes to providing and managing health care. For example, in the case of drugs, British Columbia has been a pioneer first in the implementation of reference based pricing and then in the implementation of an income based drug benefit program for seniors which can explain why real per capita provincial government spending on drugs in lowest in British Columbia. Sustainability is not a one size fits all issue and to say the entire public health system is unsustainable is clearly inaccurate, given that hospital and physician services -- about 56 per cent of provincial government health spending -- are sustainable by any reasonable definition and are more sustainable in some provinces than others. Along with understanding the drivers of overall health spending, understanding the drivers of health expenditure categories is also a necessary component of sustainability.

Figure 9
Data source: CIHI, National; Health Expenditure Database and Statistics Canada

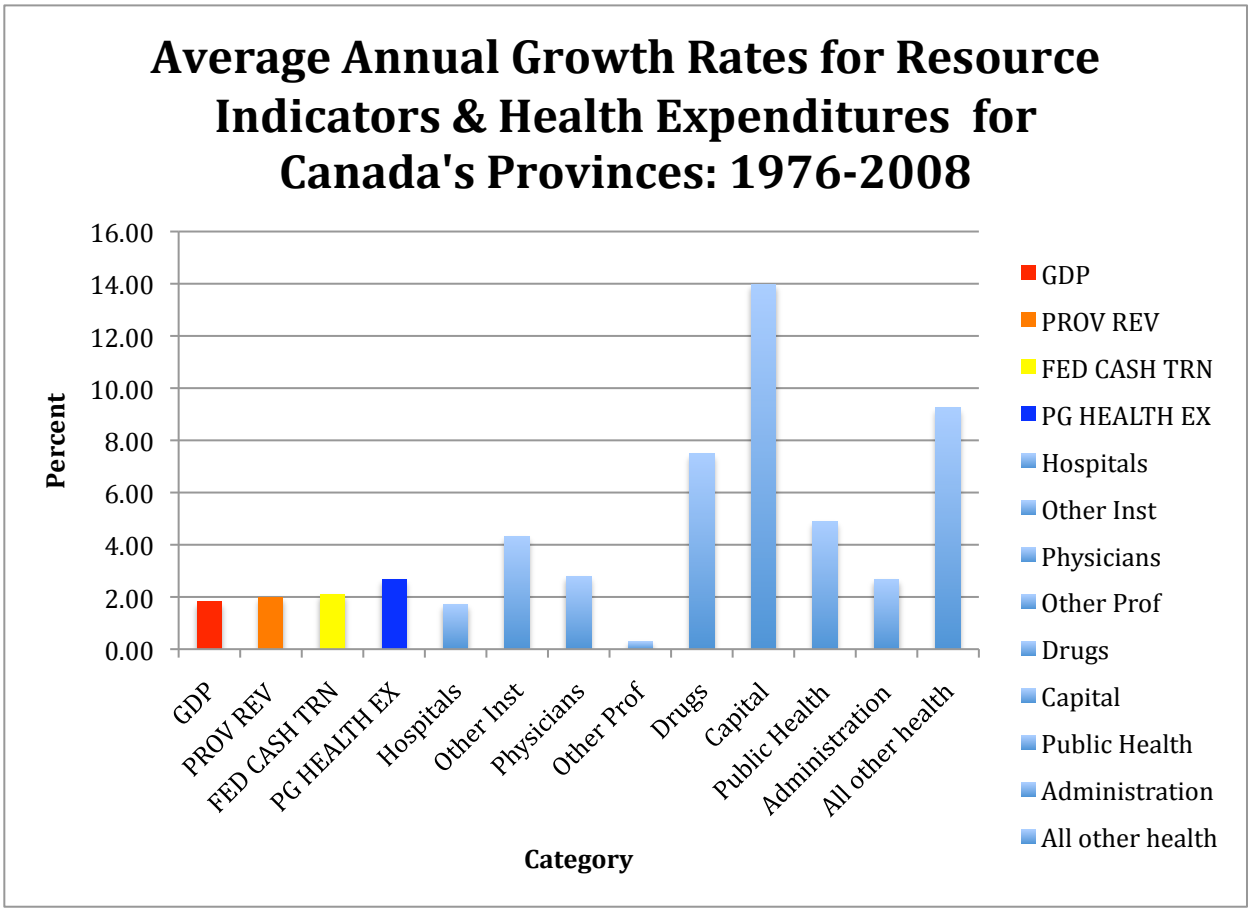


Figure 10
Data source: CIHI, National Health Expenditure Database

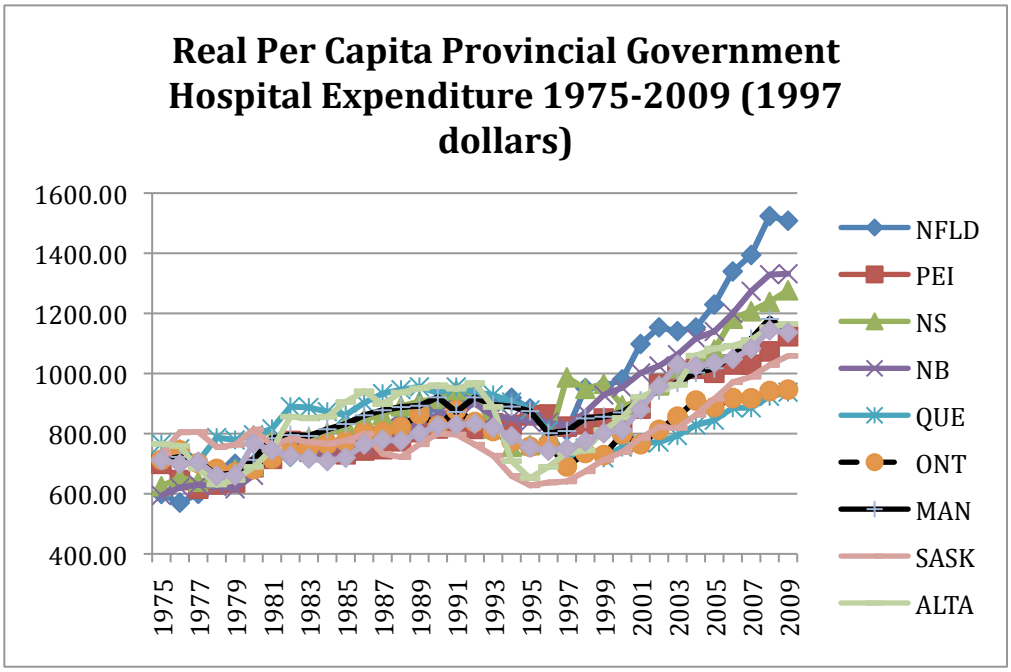
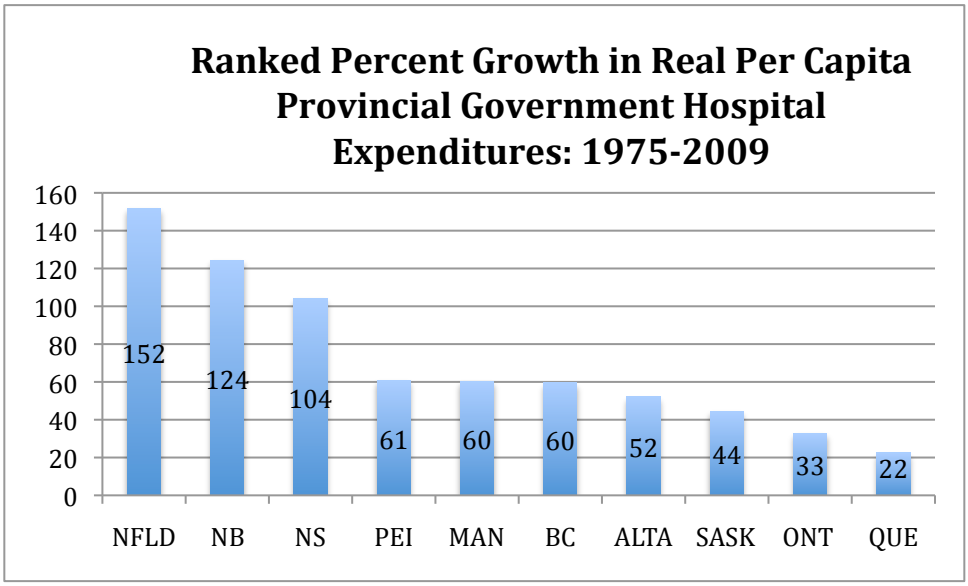


Figure 11
Data Source: CIHI, National Health Expenditure Database



5. Determinants of Provincial Government Health Spending by Expenditure Categories

A pooled time-series cross-section regression[15] model is estimated for each provincial government health expenditure category of the form:

$$(1)\ H_{it} = f(Y_{it}, z_{1it}, z_{2it}, \ldots z_{nit})$$

where H_{it} is real per capita government health expenditures of the i-th province at period t, Y_{it} is the per capita income of the i-th province at time t and z_1 to z_n represent a vector of social, demographic, economic and policy variables of the i-th province/territory at time t which are determinants of H_{it}. These determinants of expenditure are essentially cost-drivers and the literature has identified key drivers to include population growth, population aging, income growth, inflation and enrichment factors such as technological change.[16]

For this regression analysis, the determinants of real per capita government health spending are population, time trend[17], the proportion of population aged 65 to 74 years and the proportion aged 75 and over,[18] real per capita federal cash transfers[19] and real per capita provincial debt interest.[20] [21] As well, a set of transfer regime

[15] The pooled regression is preferable to single province or territorial estimates because pooling allows for a larger sample and more degrees of freedom.

[16] See Constant, et.al., (2011).

[17] A time trend (YEAR) is sometimes used to account for technological change's impact though modelling the impact of technological extension on health care spending can be a complicated issue. If new techniques generate cheaper health procedures, there could be expenditure reductions associated with technological change. Cutler et al., (1998) report that between 1983 and 1994, the real quality-adjusted price of heart attack treatments declined at an annual rate of 1.1 percent. At the same time, with expensive new treatments, technological change can be associated with rising health expenditures. Given that technological change occurs over time, a time index is a way to control for the effect of technological change on health expenditures but it is an imperfect one.

[18] An aging population is a source of some debate as to its importance as a health care expenditure driver. For a sample of papers for Canada, see Denton and Spencer (1995), Hogan and Hogan (2002) and Seshamani and Gray (2004). While aging is seen as a factor in rising health expenditures, its contribution has recently been determined to be relatively small compared to factors such as rising care expectations, time to death, rising input prices and technological extension. There is also a vast international literature on the importance of an aging population on health expenditure impact, which has reached similar conclusions. See Palangkaraya and Yong (2009), Bryant et al., (2004), Spillman and Lubitz (2000), Zweifel et al. (1999), O'Connell (1996), Meerdin et al. (1998), Getzen (1992).

[19] Federal cash transfers are important operating revenue sources for Canada's provincial governments but vary across provinces and time. About half of federal transfers are specifically marked for health. However, general-purpose transfers like equalization can be applied to health. It is difficult to separate out the extent of health transfers given the large amount of change in transfer arrangements over time both in dollar amounts as well as institutional arrangements.

[20] Balanced budgets after the mid 1990s opened up a fiscal dividend that enabled provinces to spend more on health, even while lowering income and corporate taxes. See Landon et al.,(2006).

[21] For an excellent survey of the international health expenditure determinants literature, see Gerdtham and Jonsson (2000). The first generation of such determinants studies often used international data. See Leu (1986), Parkin, McGuire and Yule (1987), Brown (1987), and Gerdtham et al (1992). See also Hitiris and

dummy variables is also specified to capture the onset of new federal transfer regimes and programs and a dummy variable for the onset of the Canada Health Act in 1984.[22] Inflation is accounted for in all these regressions by using real data (in 1997 dollars). Province dummies are also included in the regressions for the provinces and the territories to capture time invariant regional effects not captured by other variables in the model. The Canadian federation is diverse and regional preferences may be at play as well as factors of culture, tax systems (Stabile, 2001) and geography in determining the level of public and private health expenditures and the balance between them.

The variables are defined in Table 1 and STATA 11 is the statistical package used to analyze the data. The models are estimated for the period 1975 to 2008 because health expenditure figures from CIHI for 2009 and 2010 are generally forecasts and this period was also marked by a severe recession and financial crisis which may introduce additional variability into determinant variables such as GDP. The model specification is log-linear and the estimation technique was OLS.[23] The results are presented in Tables 2 and 3.

The results show that the significance and size of the coefficients varies across the assorted expenditure categories which has implications for future health expenditure growth as well as sustainability of the heath care system. When the regression for total provincial government health spending is examined, real per capita expenditures are positively and significantly related (at the 5% level) to year, per capita income, and per capita federal cash transfers. After controlling for other variables, relative to Ontario, all provinces spend significantly less in per capita terms. The onset of the Canada Health and Social Transfer is associated with a significant drop in real per capita provincial government health spending while the Canada Health Act has a significant positive impact. Real per capita health spending is also negatively and significantly related to real per capita debt interest paid demonstrating that there was a significant fiscal dividend effect on health spending from balancing budgets and low interest rates.

The year coefficient is not significant for health spending on other institutions, capital, and public health but is positive and significant for the remaining categories and the annual increases range from a low of 1.6 percent for other health professionals to a high of 10.9 percent for drugs. Indeed, the time trend effects are

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Posnett (1992), Barros (1998), Gerdtham, Jonsson, MacFarlan and Oxley (1998), Di Matteo and Di Matteo (1998) and Ariste and Carr (2003).

[22] Over the years a number of regime changes have occurred with respect to transfers. In 1977, there was the onset of Established Program Financing (EPF), which replaced federal-provincial cost-sharing on health with a block grant. In 1984 there was the onset of the Canada Health Act (CHA) which tied the receipt of federal transfers to running a health care system that met basic conditions. In 1996, EPF and the Canada Assistance Plan, which funded income support, were collapsed into one transfer (and the cash portion reduced by one-third). This new transfer was called the Canada Health and Social Transfer (CHST). Finally, in 2005 the CHST was broken up into two transfer payments – the Canada Health Transfer and the Canada Social Transfer.

[23] There was no adjustment for heterskedasticity or autocorrelation in these estimates.

largest for drugs, followed by all other health spending (9.9 percent) and then administration (7.4 percent). Hospital and physician expenditures by comparison come in at only 2.5 and 2.1 percent respectively. The forces driving the time trend after controlling for income, population, transfers and transfer regime shifts are not entirely clear. For drugs, it could indeed by technological extension and perhaps monopoly power on the part of drug companies but what explains the increases in administration or all other health spending due to time is not readily apparent and may rest in aspects of provincial government policy.

Real per capita income is a positive and significant determinant of total provincial government health as well as the specific categories of hospitals, physicians, capital and administration. Real per capita transfers are a positive and significant determinant of total spending, as well as hospitals, other institutions, physicians and administration. However, transfers are negatively and significantly related to other professional health spending.

There are variations in the provincial coefficients relative to Ontario across the expenditure categories. For example, relative to Ontario, most provinces spend less on hospitals and physician services while many of them spend significantly more in the areas of other health professionals, public health and capital. Drug spending is an area where only Saskatchewan spends significantly more per capita than Ontario –all other things given – while Newfoundland, Quebec and Alberta spend significantly less. After controlling for all other variables, British Columbia despite spending the lowest per capita on provincial government drug plans, does not differ significantly from Ontario.

The population variable has a negative and significant effect on real per capita provincial government health spending for total health spending as well as hospitals, other institutions, physicians, administration and all other health. This would suggest that there may be some economies of scale from larger populations when it comes to health costs. On the other hand, population is positive and significant for the categories of other professionals and public health where it appears that more people drives up per capita costs.

The aging variables are of particular interest given the concerns that a rapidly aging population will drive up health spending. For total health spending the coefficients on the age proportion variables are not statistically significant but their significance as well as the direction of the effect on spending is dependent on the health expenditure category. For hospitals, expenditures are positively and significantly related to the proportion of population aged 65 to 74 but negatively and significantly related to the proportion aged 75 years and over. This result complements the coefficients on other institutions which shows a larger positive effect from the proportion aged 75 years and over and suggests that with an aging population there will be a transfer out of hospital based care and into other institutional settings. Physicians will see an expenditure impact from the growing proportion of population aged 65 years and over but the effect of those aged 75

years and over is not statistically significant. For the other professionals category, population aging drives up spending in the 65 to 74 age category but then there is a negative effect as the population hits the 75 years and over category. This pattern of rapidly rising costs in the 65 to 74 year age category and then reductions with increases in the proportion aged 75 years and over also effects drugs and administration. However, the largest coefficient on the proportion aged 65 to 74 years is for drug spending. Capital spending drops significantly as the population aged 65 to 74 years increases while public health spending is only positively and significantly affected when the proportion aged 75 years and over grows. All other health spending is unique in that it is negatively and significantly related to both age proportion variables.

These results for the age distribution variables are in keeping with recent international evidence suggesting that the effect of aging on health is more complicated because the effect of aging per se is also accompanied by proximity to death with its higher end of life costs.[24] Palangkaraya and Yong (2009) find that for 22 OECD countries in the early 1990s, the effect of population aging on health expenditure is negatively correlated with health expenditure once the proximity to death is controlled for and therefore if expensive medical treatment for patients near end of life can be controlled for, health expenditure growth from population aging is unlikely to present as serious a problem.

The transfer regime shift variables also provide some interesting information on the impact of policy changes in transfer payments over time aside from changes in the amounts. Established Program Financing had a negative and significant effect on hospital spending and administration and is actually associated with a positive and significant effect on public health, all other health other institutions and other professionals. The onset of the Canada Health and Social Transfer also had a negative and significant effect on hospital and physician spending, drugs and administration further suggesting that federal transfer regime shifts are certainly one way of bringing about sustainability in health spending at least for the largest expenditure categories such as hospitals. Interestingly enough, the onset of the CHST also seems to have had a positive and significant effect on spending on other institutions and public health. This suggests that transfer regime shifts may have sparked a search by provincial governments for more cost effective ways of delivering hospital and physician services through a broader approach to health such as public health or other health approaches.

Finally, the impact of respective provincial fiscal situations is captured via the debt interest variable. The variable was negative and significant for total health spending, hospitals, physicians, drugs, and public health suggesting that the fiscal dividend from balanced budgets and lower interest rates was directed into health but specifically into these expenditure categories. However, debt interest was not

[24] The "cost-of-dying" approach implies that proximity to death rather than aging is the more important cost-driver. Seshamani and Gray (2004) find a ten-fold increase in health costs in the final year of life.

surprisingly positively and significantly related to capital spending, which is often financed by borrowing, but it was also positively related to all other health spending and other professionals. The mechanism here is not entirely clear but may reflect a shift in spending into these categories at a time of high interest rates perhaps as some type of restructuring during a period of deficits and fiscal restraint.

6. Sustainability: A Discussion & Conclusion

Sustainability of provincial government health spending requires that expenditure increases on health match or fall below increases in measures of the resource base. The general solutions require either increased resources via taxation or user fees, or outright expenditure and service cuts, restructuring and reforms for internal efficiencies, or simply moving some provincial government health expenditures to the private sector.

Is provincial government health spending in Canada fiscally sustainable? When the regression results and aggregate trend evidence are examined, the conclusion is that it depends on a number of factors. It depends on economic growth and its effect on per capita GDP and federal transfers and ultimately provincial government revenues. It depends on the policy response to cost increases and technological change as evident in the effect of the time trend variable. It depends on age. It depends on the level of provincial debt and the resources required to service that debt. It depends on which province you live in with Ontario, British Columbia and Quebec seemingly the most sustainable while Newfoundland, New Brunswick and Nova Scotia as the least sustainable. And finally, sustainability also depends on the category of health spending under consideration with hospital, physician and other professional health spending as the most sustainable while capital spending, drugs, and all other health as the least sustainable.

As a result, there are no simple blanket solutions to sustainability and sustainability solutions will need to be tailored to both provinces and expenditure categories. Technological change and policy as evidenced by the time trend coefficient is more important as an expenditure driver for drugs, administration and all other health. Sustainability efforts in these categories need to devise policies that bend the expenditure curve downward independently of drivers such as income and age. An aging population is also not the expenditure driver it is stereotypically depicted as. While the proportion aged 65 to 74 is associated with expenditure increases for a number of categories, there are then declines as the population moves into the age 75 and over category. While the costs of dying drive up spending, there may also be a healthy survivor effect accounting for a drop on average in spending over age 75.

For hospitals, an aging population drives spending up as the proportion aged 65 to 74 increases, but then expenditures decline as the proportion 75 and over increases and care moves to other institutional settings. Indeed, a better senior care system would go far in both improving the health system's performance towards seniors as well as dealing with costs in the hospital setting. As for fiscal health, those

provinces with a higher debt load will find it more challenging to sustain their public health care systems given the resources that are required to service their debt. Quebec, New Brunswick, and Newfoundland and Labrador will particularly face challenges in this context given their high per capita debt service costs.

Sustainability of government health care is not an all or nothing proposition and it is not an escalator with an inevitable outcome. Indeed, the experience of the early 1990s illustrates that when provincial governments face a fiscal wall, they are able to constrain health spending quite dramatically albeit with considerable pain in terms of the delivery of services to the public. Rising incomes and transfer payments mean increased resources for government health spending with hospital and physician spending particularly dependent on these variables. At the same time, of all the health expenditure categories, these two alone have been the most likely to parallel growth in the resource base. Obviously, reductions in income growth or transfer payments will ultimately also result in restraint in the growth of health care spending.

Table 1
Regression Variable Definitions

Dependent Variables

Real per capita provincial government health expenditures in 1997 dollars deflated using the Government current Expenditure implicit Price Index.

Rhltpgc	Total health spending .
Rpghospc	Hospitals.
Rpgothinstc	Other instituions.
Rpgphysc	Physicians
Rpgothprofc	Other professionals.
Rpgdrugsc	Drugs.
Rpgcapitalc	Capital.
Rpgpubhltc	Public health.
Rpgadminc	Administration.
Rpgothltc	All other health.

Independent Variables

y	Real per capita gross domestic product in 1997 dollars. Deflated using the Government Current Expenditure Implicit Price Index.
t	Real per capita federal cash transfer revenues. In 1997 dollars, deflated using the Government Current Expenditure Implicit Price Index.
nfld	1 if Newfoundland, 0 otherwise.
pei	1 if PEI, 0 otherwise
ns	1 if Nova Scotia, 0 otherwise.
nb	1 if New Brunswick, 0 otherwise.
que	1 if Quebec, 0 otherwise.
ont	1 if Ontario, 0 otherwise.
man	1 if Manitoba, 0 otherwise.
sask	1 if Saskatchewan, 0 otherwise.
alta	1 if Alberta, 0 otherwise.
bc	1 if British Columbia, 0 otherwise.
p6574	Proportion of population aged 65 to 74.
p75	Proportion of population aged 75 or greater.
Rdebtintc	Real per capita provincial government debt interest.
Pop	Population.
yr	Year

epf	1 if Established Program Financing in effect (1977-1995), 0 otherwise.
cha	1 if Canada Health Act in effect (1984-2008), 0 otherwise.
chst	1 if Canada Health and Social Transfer in effect (1996-2004), 0 otherwise.
chtcst	1 if separate Canada Health Transfer and Canada Social Transfer in effect (2005-2008), 0 otherwise.

Table 2
Regression Results for Determinants of Provincial Government Health Spending: I

Independent Variables	Total	Hospitals	Other Instit	Physicians	Other Profnls
Dependent Variables					
yr	**0.02291850**	**0.02535860**	-0.00457980	**0.02189970**	**0.01583370**
y	**0.00000641**	**0.00000810**	-0.00000532	**0.00000576**	0.00000359
t	**0.00006250**	**0.00006210**	**0.00019050**	**0.00007900**	**-0.00009350**
nfld	**-0.43061730**	**-0.58335820**	**-0.81315200**	**-1.44162900**	0.30714800
pei	**-0.48224340**	**-0.53286200**	**-1.45914100**	**-1.53606300**	**1.21948400**
nb	**-0.43315520**	**-0.50210430**	**-1.32361800**	**-1.34198100**	-0.18595560
ns	**-0.50089810**	**-0.50021430**	**-1.80625100**	**-1.34926000**	**0.88150720**
que	**-0.11534850**	**-0.14943340**	-0.19165940	**-0.57360290**	**0.34575570**
man	**-0.28467260**	**-0.37872810**	**-0.92145250**	**-1.17787300**	**1.02874400**
sask	**-0.29331820**	**-0.46447390**	**-1.08286400**	**-1.19821000**	**1.61174100**
alta	**-0.27206360**	**-0.55413710**	**-0.46029650**	**-0.89306860**	**1.11887300**
bc	**-0.14894240**	**-0.38560140**	**-0.52097050**	**-0.57203960**	**1.27508100**
pop	**-0.00000003**	**-0.00000006**	**-0.00000009**	**-0.00000009**	**0.00000007**
prop6574	1.79224800	**2.69336100**	**8.66612700**	**3.50254200**	**9.34365700**
prop75	-0.72827750	**-9.82520900**	**25.03388000**	3.05409100	**-38.40241000**
epf	-0.00360380	**-0.04961880**	**0.26732710**	-0.02762720	**0.22548350**
chst	**-0.06866970**	**-0.18374700**	**0.40444500**	**-0.08968570**	0.02198730
cha	**0.04265750**	**0.05514770**	-0.03248150	**0.09161260**	**0.18349230**
chtcst	-0.05169970	**-0.17625320**	**0.41186270**	-0.08708360	0.03147490
rdebtintc	**-0.00009910**	**-0.00008340**	0.00005020	**-0.00014720**	**0.00021350**
_cons	**-38.10765000**	**-43.11645000**	13.15133000	**-37.24549000**	**-28.62258000**
Adjusted R2	0.93	0.82	0.84	0.93	0.89
F-statistic	233.5	76.31	90.38	221.55	141.31

*Log-linear specification and OLS estimation technique.
** Bold denotes significant at 5% level.

Table 3
Regression Results for Determinants of Provincial Government Health Spending: II

Independent Variables	Drugs	Capital	Admin	Public Health	All Other Health
Dependent Variables					
yr	**0.10852950**	0.02054180	**0.07428670**	0.00052200	**0.09923240**
y	0.00000006	**0.00004050**	**0.00001600**	0.00000328	0.00000821
t	0.00001440	-0.00012980	**0.00019420**	-0.00001120	0.00002020
nfld	**-0.51339390**	**1.75542400**	**-1.84867700**	**2.21547100**	**-2.15487000**
pei	-0.38213210	**2.19622000**	-0.19069640	**2.08524600**	**-1.43095900**
nb	-0.07564280	**2.34422900**	**-0.99586510**	**1.76515200**	**-2.06823900**
ns	0.09467000	**1.93333400**	**-0.95773280**	**1.36616200**	**-1.88942100**
que	**-0.22610260**	**0.87245190**	-0.06887160	**0.83965980**	**-1.08325300**
man	-0.01307800	0.89701530	-0.52408300	**1.96810700**	**-0.95839070**
sask	**0.51894440**	**1.72625400**	-0.51053470	**2.18909400**	**-1.00250300**
alta	**-0.55362320**	1.09250300	**-1.36075400**	**2.41910200**	**-1.46040100**
bc	-0.02802510	**1.49735700**	-0.02178260	**1.48394500**	-0.29116420
pop	-0.00000001	0.00000015	**-0.00000011**	**0.00000021**	**-0.00000013**
prop6574	**20.70194000**	**-40.16656000**	**9.17778900**	-0.46762030	**-18.79715000**
prop75	**-43.90597000**	13.53938000	**-58.27204000**	**31.19093000**	**-21.30229000**
epf	-0.05641800	0.20407880	**-0.26327240**	**0.14236770**	**0.23752180**
chst	**-0.20438100**	-0.13028830	**-0.20196630**	**0.23207980**	0.05084650
cha	**0.17882760**	0.03550060	**-0.14715710**	0.01699080	0.05916720
chtcst	**-0.33032990**	0.16715040	**-0.27040960**	**0.25793500**	0.02679580
rdebtintc	**-0.00030740**	**0.00079240**	0.00005140	**-0.00052540**	**0.00075120**
_cons	**-210.72900000**	-38.23591000	**-141.82790000**	-0.36247490	**-190.77610000**
Adjusted R2	0.94	0.42	0.71	0.89	0.83
F-statistic	255.94	13.24	43.11	139.09	85.89

*Log-linear specification and OLS estimation technique.
** Bold denotes significant at 5% level.

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